

Groundwater Sampling Information

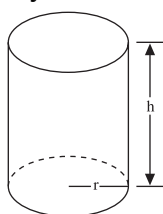
Volume Formula

$$\text{Volume} = \pi \times r^2 \times h$$

$$\text{Curved surface area} = 2 \times \pi \times r \times h$$

$$\text{End surface area} = 2 \times \pi \times r^2$$

Cylinder:



Water Data & Formulas

1 gallon water = 231 cubic inches = 8.333 pounds (@ 65°F)

1 pound of water = 27.72 cubic inches (@ 65°F)

1 cubic foot of water = 7.5 gallons = 62.4 pounds (salt water weighs approximately 64.3 pounds per cubic foot)

pounds per square inch at bottom of a column of water = height of column in feet x 0.434 (39°F)

1 miner's inch = 9 to 12 gallons per minute

Horsepower to Raise Water

$$\text{Horsepower} = \frac{\text{gallons per minute} \times \text{Total Head in feet}}{3960}$$

(if pumping a liquid other than water, multiply the gallons per minute above by the liquid's specific gravity)

Gallons Per Minute through a Pipe

$$\text{GPM} = 0.0408 \times \text{Pipe Diameter inches}^2 \times \text{Feet / minute water velocity}$$

Weight of Water in a Pipe

$$\text{Pounds Water} = \text{Pipe Length feet} \times \text{Pipe diameter inches}^2 \times 0.34$$

Gallons per Minute of a Slurry

$$\text{GPM Slurry} = \text{GPM Water} + \frac{4 \times \text{Tons of per hour of solids}}{\text{Specific Gravity of Solids}}$$

Approximate Amount of Water in a Well

Diameter of casing or hole in inches	Gallons per foot of depth	Cubic feet per foot of depth	Liters per meter of depth
1	0.041	0.0055	0.509
1½	0.092	0.0123	1.142
2	0.163	0.0218	2.204
2½	0.255	0.0341	3.167
3	0.367	0.0491	4.558
3½	0.500	0.0668	6.209
4	0.653	0.0873	8.110

Capacity of Tanks

Tank diameter	Gallons per foot depth
12"	5.86
18"	13.20
24"	23.42
30"	36.6
36"	52.6
42"	71.6
48"	93.6
54"	119.0
60"	146.0
72"	211.0

Hydraulic Conversion Data*

by U.S. Geologic Survey, Water Resources Division

Volume

1 cubic ft	= 7.4805 US gallons	= 6.2321 imperial gallons	= 28.317 liters
1 U.S. gallon	= 0.13368 cubic ft	= 0.83271 imperial gallon	= 3.7854 liters
1 imperial gallon	= 0.16040 cubic ft	= 1.2009 US gallons	= 4.5437 liters
1 liter	= 0.035315 cubic ft	= 0.26417 US gallon	= 0.22009 imperial gallon
1 cubic ft	= 0.028317 cubic meter	= 0.00022957 acre-ft	
1 cubic meter	= 35.315 cubic ft	= 0.00081071 acre-ft	
1 acre-ft	= 43,560 cubic ft	= 1,233.5 cubic meters	
1 cubic mile	= 3.3792 million acre-ft		
1 cf s-day	= 86,400 cubic ft	= 1 cubic ft per second for 24 hr	

Volume conversion Factors

Initial Unit	Coefficient (multiplier) to obtain:					
	Cfs-days	Mil. cu ft	Mil. gal.	Acre-ft	In. per sq ml.	Mil. cu. meters
Cfs-days	—	0.086400	0.64632	1.9835	0.037190	.0024466
Mil. cu. ft	11.574	—	7.4805	22.957	.43044	.028317
Mil. gal.	1.5472	.13368	—	3.0689	.057542	.0037854
Acre-ft	.50417	.043560	.32585	—	.018750	.0012335
In. per sq. mi.	26.889	2.3232	17.379	53.333	—	.065785
Mil. cu. meters	408.73	35.314	264.17	810.70	15.201	—

Velocity

Velocity	Pressure (0° C = 32° F)
1 mile per hr	= 1.467 ft per sec
1 mile per hr	= 88 ft per mm
1 ft per sec	= 0.682 mile per hr
1 ft per mm	= 0.0114 mile per hr
1 ft per sec	= 0.3046 meter per sec
1 meter per sec	= 3.281 ft per sec
1 ft of head, fresh water	= 0.433 lb per sq in, pressure
1 lb per sq in, pressure	= 2.31 ft of head, fresh water
1 meter of head, fresh water	= 1.42 lb per sq in, pressure
1 lb per sq in, pressure	= 0.704 meter of head
1 atmosphere (msi.)	= 33.907 ft of water

Weight

1 cubic ft of fresh water	= 62.4 lb	= 28.3 kg
1 cubic ft of sea water	= 64.1 lb	= 29.1 kg
1 cubic meter of fresh water	= 1000kg	= 1 metric ton

Rates of Flow

1 cubic ft per sec	= 448.83 US gallons per min	= 646,317 US gallons per day	= .028317 cu meter per sec
1 cubic ft per min	= 7.4805 US gallons per min	= 10,772 US gallons per day	= .00047195 cu meter per sec
1 U.S. gallon per min	= 0.002228 cubic ft per sec	= 0.13368 cubic ft per min	= 1440 U.S. gallons per day = 0.00063090 cu meter per sec
1 U.S. gallon per day	= .000093 cubic ft per min	= .0006944 US gallon per min	
1 cubic ft per sec	= 1.9835 acre-ft per day	= 723.97 acre-ft per year	
1 acre-ft per day	= 0.50417 cubic ft per sec	= 365 acre-ft per year	= .014276 cu meter per sec
1 acre-ft per year	= 0.00138 cubic ft per sec	= 0.00274 acre-ft per day	
1 inch per hr on 1 acre	= 1 cubic ft per sec (approx)		
1 inch per hr on 1 sq mi	= 645.33 cubic ft per sec		

Rate Conversion Factors

Initial Unit	Coefficient (multiplier) to obtain:					
	Cu ft per sec	Gal per mm	Mil gal per day	Acre-ft per day	Inches per day per sq mi	Cu meters per sec
Cu ft per sec (cfs)	—	448.83	0.64632	1.9835	0.037190	.028317
Gal per mm (gpm)	0.0022280	—	.0014400	.0044192	.00008286	.000063090
Mil gal per day (mgd)	1.5472	694.44	—	3.0689	.057542	.043813
Acre-ft per day	.50417	226.29	.32585	—	.01850	.014276
Inches per day per sq mi	26.889	12.069	17.379	53.333	—	.76140
Cu meters per sec	35.314	15,850	22.834	70.045	1.3134	—

Miner's inch is a rate of discharge that has been fixed by statute in most of the western states:

1 cubic ft per sec	= 50 miner's in (Idaho, Kansas, Nebraska, New Mexico, North Dakota, South Dakota)
1 cubic ft per sec	= 40 miner's in (Arizona, California, Montana, Oregon)
1 cubic ft per sec	= 38.4 miner's in (Colorado)
1 miner's inch	= .02 cubic ft per sec (Idaho, Kansas, Nebraska, New Mexico, North Dakota, South Dakota)
1 miner's inch	= .025 cubic ft per sec (Arizona, California, Montana, Oregon)
1 miner's inch	= .026 cubic ft per sec (Colorado)

*This Chart can also be found in the AGI Data Sheets (53.1)